

Impact of oral hygiene in patients undergoing mechanical ventilation in the COVID-19 pandemic

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<http://dx.doi.org/10.1590/1806-9282.66.S2.96>

SUMMARY

COVID-19, caused by SARS-CoV-2, can present respiratory complications that often lead patients to depend on mechanical ventilation (MV) for several days. It is known that Pneumonia Associated with Mechanical Ventilation (PAMV) is frequent in patients who use this equipment for a long time. As a consequence of COVID-19, its prolonged use can lead to a worse prognosis for the patients. For this reason, in addition to the insufficiency of devices for mechanical ventilation to meet the current demand, it is necessary to adopt measures aimed at preventing complications that may aggravate the patient's clinical condition and, consequently, increase the average hospital stay and the respective hospital care costs. Therefore, the objective of this study was to discuss, in a concise and practical way, and based on the available literature, the importance of adopting adequate oral hygiene protocols for patients on mechanical ventilation. Based on the data obtained, it was identified that the adoption of effective oral hygiene measures, especially under the supervision of dental professionals, can contribute to the reduction of morbidity and mortality associated with MV, resulting in greater availability of mechanical ventilation equipment. Since such equipment is in great demand during the COVID-19 pandemic, the knowledge and implementation of effective oral hygiene measures will undoubtedly have an impact on improving the quality of care offered to patients, therefore benefiting all those in critical health conditions and assisted in ICUs.

KEYWORDS: Respiration, Artificial. Coronavirus Infections. Pneumonia, Ventilator-Associated. Oral hygiene. Severe Acute Respiratory Syndrome.

INTRODUCTION

In December 2019, an outbreak of pneumonia caused by a new Coronavirus (CoV), later named severe acute respiratory syndrome coronavirus 2 (Sars-CoV-2), began in the city of Wuhan, in the Hubei

province, China, and rapidly spread to 24 other countries, receiving the name of Coronavirus Disease 2019 (COVID-19)¹⁻⁵. In the last 20 years, the coronaviruses were responsible for two major epidemics, the Severe

DATE OF SUBMISSION: 04-Jun-2020

DATE OF ACCEPTANCE: 12-Jun-2020

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Acute Respiratory Syndrome (SARS), caused by the Severe Acute Respiratory Syndrome Coronavirus (Sars-Cov), in 2002; and the Middle East Respiratory Syndrome (Mers), caused by the Middle East Respiratory Syndrome Coronavirus (Mers-Cov), in 2012⁶⁻⁸. Considering that the Sars-CoV-2 is still spreading throughout the world, on 30 January 2020, the World Health Organization (WHO) declared a state of emergency in public health, and on 11 March 2020, declared the COVID-19 pandemic^{9,10}.

Due to its recent discovery, knowledge about COVID-19 is still limited. There is no specific antiviral treatment or vaccines currently available, scientists throughout the world test have been testing new drugs and approaches, but further studies are needed to obtain conclusive results¹¹.

On 13 March 2020, the WHO issued a document summarizing the guidelines and scientific evidence from the treatment of previous epidemics caused by CoV. Among the recommendations, they presented strategies to treat respiratory failure in severe cases; this included mechanical ventilation as an important ally in these cases¹².

Therapy for patients with severe cases of COVID-19 has been symptomatic, and oxygen therapy is the primary intervention. However, in cases in which respiratory failure is resistant to oxygen therapy, it is necessary to use mechanical ventilation, which brings with it not only the benefits for patients but also the risk of developing complications¹³.

Pneumonia Associated with Mechanical Ventilation (PAMV) is one of the most common infections related to intubated patients, so it is necessary to adopt measures to reduce its occurrence¹⁴. In this context, oral hygiene, done correctly, is a beneficial modifier factor for the occurrence of this infection. Thus, this brief but concise and essentially practical review aims to emphasize the importance of effective oral hygiene in patients on mechanical ventilation and address its positive impacts on the outcome of patients affected by COVID-19.

USE OF MECHANICAL VENTILATORS

Mechanical ventilation (MV) is a support method for the treatment of patients with acute or exacerbated chronic respiratory failure. Its main objectives are: to maintain gas exchanges, relieve the strain on respiratory muscles, revert or prevent the fatigue of respiratory muscles, decrease the consumption of

oxygen, and alleviate respiratory discomfort¹⁵.

The Chinese Center for Disease Control and Prevention (CCDC) assessed the severity of COVID-19 cases by analyzing 72,314 records, including: 44,672 (61.8%) confirmed cases, 16,186 (22.4%) suspected cases, 10,567 (14.6%) clinically diagnosed cases, and 889 asymptomatic cases (1.2%). From this study, we can conclude that 80.9% of the total confirmed cases were “mild”. However, it is alarming that serious cases accounted for 13.8% and critical cases, 4.7% of the cases confirmed, and that 5% of the total cases required an Intensive Care Unit (ICU) and 2.3% mechanical ventilation^{16,17}.

Lai et al.¹⁸, after evaluating three¹⁹⁻²¹ large-scale Chinese studies to understand the manifestations of COVID-19, concluded that out of the 278 patients with pneumonia caused by Sars-CoV-2, 72 (25.9%) were admitted to the ICU, 56 (20.1%) developed acute respiratory distress syndrome, and 23 (8.3%) needed mechanical ventilation.

In view of the high demand for this equipment throughout the world due to the COVID-19 pandemic, this item is already considered scarce in the market. According to data collected from the *Cadastro Nacional de Estabelecimentos de Saúde* (CNES)²², Brasil had, in April 2020, 70,516 respirators in operation, considering both public and private healthcare institutions, which means 33 pieces of equipment for every 100,000 inhabitants²³. However, even with the addition of 5,649 machines, in relation to January of 2020, their distribution throughout the Brazilian territory is uneven, since 51.4% of them are in the Southeastern region²². Therefore, it is important to devise strategies to reduce the damage caused by the lack of such equipment and to reduce the duration of its use, when possible.

Complications from the use of mechanical ventilators

It is known that Pneumonia Associated with Mechanical Ventilation (PAMV) is an important healthcare-related infection (HCRI) and causes an increase in mortality, days of ICU stay, and hospital costs¹⁴. In the context of the COVID-19 pandemic, these indicators may be even more worrying, considering the pathogenesis of Sars-CoV-2 and the complications already associated with this infection.

In 2011, approximately 157 thousand cases of healthcare-related pneumonia were reported in ICUs in the United States (USA), and 39% were considered

VAP. The incidence density of this infection remains approximately in the range of 4.4 cases/1,000 days of mechanical ventilation in American ICUs²⁴. In Brasil, in a study carried out in the University Hospital of the North of Minas Gerais with 190 ICU patients, the incidence of VAP was 23.2% and there was a positive association between the occurrence of pneumonia, duration of hospital stay >15 days, duration of MV >10 days, and reintubation²⁵.

It has been proposed that PAMV occurs through four mechanisms, which are: (1) aspiration of secretions, (2) inhaling of contaminated aerosols, (3) dissemination of bacteria through the hematogenic route, and (4) translocation of bacteria from the gastrointestinal tract. Of these mechanisms, the aspiration of secretion from the oral cavity and oropharynx is the most relevant, and it is called aspiration pneumonia²⁶.

MEASURES TO REDUCE THE RISK OF PAMV

In intubated patients, the coughing reflex, which promotes airway clearance, does not occur or occurs precariously. Since the airways are frequently contaminated by microorganisms of the nasal, oral, and pharyngeal regions, the chances of contamination, without such mechanical clearing, greatly increase. Therefore, oral hygiene can reduce oral colonization, prevent infections, and maintain the integrity of the mucosa, in addition to providing some comfort for the patient²⁷.

In hospital environments, the oral hygiene of patients is performed by nursing technicians, under the supervision of nurses or physicians responsible for the patient. However, this task is not a priority in the everyday lives of these professionals, perhaps to a lack of knowledge about the importance of the procedure or because it is not part of the routine standard care in institutions²⁷. In this sense, the curricula for professional nursing training should be reformulated so that nurses have sufficient theoretical support to guide the rest of the team on oral care.

The contribution of effective programs of oral hygiene is widely known for reducing the indices of PAMV^{28,29}. However, when it comes to techniques, frequency, and products to be used in the process of oral hygiene of intubated patients, there is still no consensus on which are the most effective. Some studies recommend brushing the teeth twice a day³⁰. Regarding the use of products, Wakiuchi et al.³¹, after analyzing 17 studies on the topic,

identified that four recommended the use of alcoholic chlorhexidine 0.12%. The Brazilian Health Regulatory Agency (Anvisa)³² recommends, with a high level of evidence, using chlorhexidine for oral hygiene to prevent HCRI. A study that evaluated oral hygiene with 0.12% chlorhexidine every 12 hours, in 105 ICU patients, concluded that VAP occurred less frequently in the group that received the intervention (15.9%) than in the control group (16.2%), which was composed of 108 patients³³.

It is worth mentioning that, in patients hospitalized in the ICU, oral hygiene can become precarious by the association of some factors, such as: reduction of the natural cleaning of the mouth provided by chewing and the movement of the tongue and cheeks, and possible reduction in the salivary flow caused by some medications. In addition, when there is the presence of a tracheal tube, the access to the oral cavity becomes even more difficult and may increase the formation of biofilm³⁴.

An important contribution to improve the oral health care of patients in MV is including a dentistry team in patient care. A study conducted by Souza et al.³⁵ evaluated the inclusion of a dentistry team in a public hospital in the city of Belo Horizonte, MG, aiming to implement a new oral hygiene protocol using 0.12% chlorhexidine to prevent infections associated with the ICU environment. The *ventilation bundle*, a protocol of measures based on evidence and implemented together, was deployed by the medical and nursing team to reduce the incidence of PAMV. Pneumonia, which was the main pathological manifestation from ICU infections (33.3%), was no longer the most frequent event (3.5%) after the implementation of the oral hygiene protocol. The process of oral hygiene is not always included in *the bundle*; however, the inclusion of the procedure is recommended given its proven positive impact. Regarding the perception of professionals involved in the care of these patients on the inclusion of dentistry in the ICU, 100% were favorable to it, and 62% acknowledged the contribution of the oral hygiene protocol in reducing the number of VAP cases.

Franco et al.³⁶ suggest a oral hygiene protocol to be carried out by a dental surgeon along with the nursing team. It begins with basic principles, covering, for example, the positioning of the patient on the bed (dorsal decubitus at 30 to 45 degrees) and the observation of the patient's monitoring parameters, which must be maintained after the procedure. Oral

hygiene must be carried out using a swabbing device and chlorhexidine 0.12%, every 12 hours. The protocol includes the following steps: (1) Disinfect hands; (2) put on sterile gloves; (3) constantly aspire the oral cavity during the procedure; (4) carry out oral hygiene with a swab soaked in chlorhexidine 0.12% on tooth surfaces, mucosa, palate, dorsum of the tongue, and intubation tube; and (5) apply oral lubricant on the lips every 6 hours to minimize dryness (Figure 1). According to Santos et al.³⁷, the use of a tongue scraper learner is also an effective mechanism to reduce biofilm in patients undergoing mechanical ventilation.

Dental surgeons are still not part of most hospital teams. The main obstacle to their inclusion is the lack of prioritization of dental care in the face of the many complications that patients already present³⁸. However, it is worth mentioning that, when present, the dentistry work should focus on patient care, aiming to reduce the risk of aggravation and/or systemic complications as a result of their oral health, this includes a prior assessment of the patient, continuous monitoring during their hospital stay, and follow-up after the

completion of the treatment^{34,39}. Thus, the inclusion of hospital dentistry is important to promote integral patient care through a multidisciplinary team, and, consequently, improve the health condition⁴⁰.

Given the above, it is expected that dental support in severe cases, when the survival of the patient requires MV, can be widely recognized as a strategy that can effectively contribute to the reduction of comorbidities, provide more comfort, and improve the general conditions of the patient.

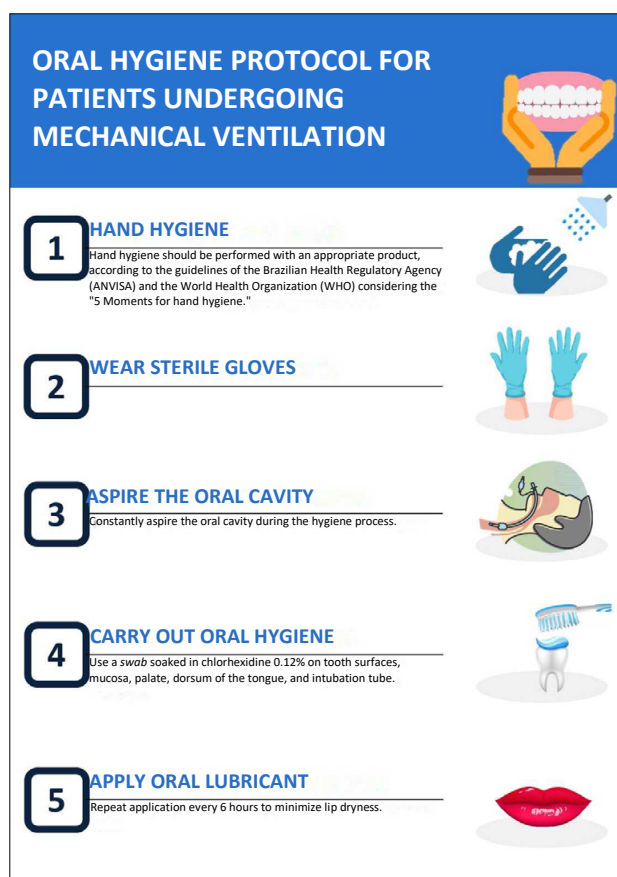
FINAL CONSIDERATIONS

Pneumonia Associated with Mechanical Ventilation (PAMV) is an important complication in patients in intensive care and undergoing mechanical ventilation, with a great impact on health indicators. Although there is no scientific consensus about techniques, frequency, and products to be used in the process of oral hygiene of intubated patients, chlorhexidine has been the most recommended, including by the Brazilian National Health Agency. Additional measures, such as the removal of the dental biofilm and orotracheal aspiration, may help to reduce the incidence, duration, and aggravation of PAMV cases. These measures are essential, particularly in the current pandemic scenario, in which the pathogenesis of Sars-CoV-2 and the complications from COVID-19 often lead to the use of MV. Considering the documented number of mechanical ventilators, which are insufficient to meet the many critical cases of COVID-19, measures that may reduce the need for MV are very welcome and should be widely disseminated among health professionals and the population in general.

Finally, it is worth reiterating that the inclusion of dentistry in hospital environments is also an important ally, both in the implementation of oral hygiene protocols and in conducting studies that might lead to conclusions about the procedures and products that are more effective in oral health care and, consequently, in reducing the morbidity and mortality of patients.

Therefore, it is recommended that public health authorities stimulate the joint participation, responsibility, and continuing education of all professionals involved in the oral hygiene of patients undergoing mechanical ventilation in ICUs, and, in particular in serious cases of COVID-19. By effectively deploying and implementing this strategy, there will be a significant gain in the status of patients under treatment

FIGURE 1. ORAL HYGIENE PROTOCOL IN PATIENTS UNDERGOING MECHANICAL VENTILATION. ADAPTED FROM LAMBERTUCCI ET AL.³⁶



and hospitalized in ICUs due to the worsening of Sars-CoV-2 infections, as well as an optimization regarding the use of equipment intended for MV.

Acknowledgments

The present study was carried out with the support of the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes)* - Funding code 001.

Author's Contribution

1, 2, 3 - Project Concept, data curatorship, research, methodology, and drafting.

4, 5, 6 - Data analysis, methodology, and review of the draft and final text.

7 - Concept, data analysis, methodology, project management, supervision, review of the draft and final text.

RESUMO

A COVID-19, causada pelo Sars-CoV-2, pode apresentar complicações respiratórias que, muitas vezes, levam o paciente a depender da ventilação mecânica por vários dias. Sabe-se que a *Pneumonia Associada à Ventilação Mecânica (PAVM)* é frequente nos pacientes que utilizam esse equipamento por um longo período de tempo e que sua ocorrência, consequente à COVID-19, pode cursar com um pior prognóstico para o paciente. Por esse motivo, e somado à insuficiência de aparelhos para atendimento da demanda atual, faz-se necessária a adoção de medidas que visem à prevenção de complicações que possam agravar o quadro clínico do paciente e, consequentemente, aumentar o tempo médio de internação e os respectivos custos da assistência. Sendo assim, o objetivo deste estudo foi discorrer de forma concisa e prática, com base na literatura disponível, sobre a importância da adoção de protocolos adequados de higiene oral nos pacientes em ventilação mecânica. Com base nos dados obtidos, identificou-se que a adoção de medidas efetivas de higiene oral, principalmente sob a supervisão do profissional dentista, pode contribuir para a redução da morbimortalidade associada à PAVM, resultando em maior disponibilidade de equipamentos de ventilação mecânica. Desde que tais equipamentos estão sendo muito demandados durante a pandemia da COVID-19, o conhecimento e a implantação de medidas efetivas de higiene oral, indubitavelmente, repercutirão na melhoria da qualidade da assistência oferecida aos pacientes, portanto, beneficiando todos aqueles em situação crítica de saúde e assistidos em UTIs.

PALAVRAS-CHAVE: Respiração artificial. Infecções por coronavírus. Pneumonia associada à ventilação mecânica. Higiene bucal. Síndrome respiratória aguda grave.

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Regarding the article "Impact of oral hygiene in patients undergoing mechanical ventilation in the COVID-19 pandemic" with DOI number: <http://dx.doi.org/10.1590/1806-9282.66.S2.96>, published in *Journal of the Brazilian Medical Association*, 2020;66(SUPPL 2), page 96, authors changed

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